# L6 A Level Maths Assessment 2 MS

1.

| Q | Marking instructions | AO | Marks | Typical solution |
|---|---|---|---|---|
| 2 | Circles correct answer | 1.1b | B1 | $-\frac{1}{x^2}$ |
| | Total | | 1 | |

2.

| | | | | |
|---|---|---|---|---|
| 3(a)(i) | States correct value of $p$ | AO1.2 | B1 | $p = \frac{1}{2}$ |
| (a)(ii) | States correct value of $q$ | AO1.2 | B1 | $q = -2$ |
| (b) | Uses valid method to find $x$ , PI | AO1.1a | M1 | $\frac{1}{2} + x = -2$ |
| | Obtains correct $x$ , ACF | AO1.1b | A1 | $x = -2.5$ |
| | Total | | 4 | |

3.

| | | |
|---|---|---|
| $\frac{dy}{dx} = 9x^2 - 4x$ | M1* | Differentiates and substitutes $x = -1$ into their derivative |
| $\left.\frac{dy}{dx}\right\|_{x=-1} = 9(-1)^2 - 4(-1) = 13$ , so normal gradient is $-\frac{1}{13}$ | A1 | Correct gradient of the normal identified or used to obtain final answer |
| At $x = -1$, $y = -5$ | B1 | Correct $y$ coordinate at $x = -1$ |
| So equation of normal is $y - -5 = -\frac{1}{13}(x - -1)$ | M1(dep*) | Method to find equation of the normal using their coordinates and a gradient they have identified as the gradient of the normal. |
| $\Rightarrow x + 13y + 66 = 0$ | A1<br>[5] | Correct equation of the normal in the required form. Coefficients must be integers so accept integer multiples of this but not non-integer multiples. ISW |

4.

| | | |
|---|---|---|
| States gradient of $4y-3x=10$ is $\frac{3}{4}$ oe<br>or rewrites as $y=\frac{3}{4}x+\ldots$ | B1 | 1.1b |
| Attempts to find gradient of line joining $(5,-1)$ and $(-1,8)$ | M1 | 1.1b |
| $=\frac{-1-8}{5-(-1)}=-\frac{3}{2}$ | A1 | 1.1b |
| States neither with suitable reasons | A1 | 2.4 |
| | (4) | |
| | | **(4 marks)** |

5.

| | | | |
|---|---|---|---|
| **(a)** | Attempts to complete the square $(x\pm3)^2+(y\pm5)^2=\ldots$ | M1 | 1.1b |
| | (i) Centre $(3,-5)$ | A1 | 1.1b |
| | (ii) Radius 5 | A1 | 1.1b |
| | | **(3)** | |
| **(b)** | Uses a sketch or otherwise to deduce $k=0$ is a critical value | B1 | 2.2a |
| | Substitute $y=kx$ in $x^2+y^2-6x+10y+9=0$ | M1 | 3.1a |
| | Collects terms to form correct 3TQ $(1+k^2)x^2+(10k-6)x+9=0$ | A1 | 1.1b |
| | Attempts $b^2-4ac\ldots0$ for their $a$, $b$ and $c$ leading to values for $k$<br>$"(10k-6)^2-36(1+k^2)\ldots0" \rightarrow k=\ldots,\ldots$ $\left(0 \text{ and } \frac{15}{8}\right)$ | M1 | 1.1b |
| | Uses $b^2-4ac>0$ and chooses the outside region (see note) for **their** critical values (Both $a$ and $b$ must have been expressions in $k$) | dM1 | 3.1a |
| | Deduces $k<0, k>\frac{15}{8}$ oe | A1 | 2.2a |
| | | **(6)** | |
| | | | **(9 marks)** |

6.

| Question | Scheme | Marks | AOs |
|---|---|---|---|
| **10** | Considers $\dfrac{(x+h)^3-x^3}{h}$ | B1 | 2.1 |
| | Expands $(x+h)^3 = x^3+3x^2h+3xh^2+h^3$ | M1 | 1.1b |
| | so gradient (of chord) $= \dfrac{3x^2h+3xh^2+h^3}{h} = 3x^2+3xh+h^2$ | A1 | 1.1b |
| | States as $h \to 0$, $3x^2+3xh+h^2 \to 3x^2$ so derivative $= 3x^2$ * | A1* | 2.5 |
| | | | **(4 marks)** |

7.

| | | | |
|---|---|---|---|
| **(a)** | $kx+(1-k)y=5 \Rightarrow y=\dfrac{5}{1-k}-\dfrac{kx}{1-k}$<br>so gradient is $-\dfrac{k}{1-k}$ | M1<br>A1<br>**[2]** | Attempts to re-arrange for $y$<br>Correct answer oe. Answer only is 2/2. |
| **(b)** | Gradient is $\dfrac{k-4}{3-1}=\dfrac{k-4}{2}$ | B1<br>**[1]** | Correct gradient oe |
| **(c)** | By perpendicularity, $\dfrac{k-4}{2}\times\dfrac{-k}{1-k}=-1$<br>$\Rightarrow \dfrac{-k(k-4)}{2(1-k)}=-1$<br>$\Rightarrow -k^2+4k=-2+2k$<br>$\Rightarrow k^2-2k-2=0$ **AG** | M1*<br>M1(dep*)<br>A1<br>**[3]** | Forms a correct equation<br>Attempts to rearrange to form a 3TQ<br>Convincing proof with no errors seen. Answer given. |
| **(d)** | $k=1\pm\sqrt{3}$ | B1<br>**[1]** | Cao |

8.

| Q | Marking instructions | AO | Marks | Typical solution |
|---|---|---|---|---|
| **6(a)** | Finds correct midpoint of *AB* | 1.1b | B1 | (4,1) |
| | **Subtotal** | | **1** | |

| Q | Marking instructions | AO | Marks | Typical solution |
|---|---|---|---|---|
| 6(b) | Calculates length of radius, *AC*, *BC* or half *AB* using 'their' centre. | 3.1a | M1 | $r = \sqrt{(4-1)^2 + (1-4)^2}$<br>$= \sqrt{18}$<br>$(x-4)^2 + (y-1)^2 = 18$<br>$x^2 - 8x + 16 + y^2 - 2y + 1 = 18$<br>$x^2 + y^2 - 8x - 2y = 1$ |
| | Obtains correct value for the radius or square of the radius. | 1.1b | A1 | |
| | Derives circle equation in any form using their centre and radius.<br>Condone sign error in brackets.<br><br>Or<br><br>Completes the square on given equation to obtain centre and radius.<br><br>Condone sign error in brackets. | 1.1a | M1 | |
| | Completes reasoned argument to obtain equation in given form<br><br>Or<br><br>Justifies that the centre and radius obtained from completing the square on the given equation corresponds to the midpoint from part (a) and the radius from part (b)<br>AG | 2.1 | R1 | |
| | **Subtotal** | | **4** | |

| Q | Marking instructions | AO | Marks | Typical solution |
|---|---|---|---|---|
| 6(c) | Substitutes $y = 0$ into the given formula and solves the quadratic equation.<br><br>Or<br><br>Uses Pythagoras on the triangle CDM where M(4 , 0) to find DM or EM | 3.1a | M1 | $x^2 - 8x - 1 = 0$<br><br>$x = 4 + \sqrt{17}$ and $4 - \sqrt{17}$<br><br>DE = $2\sqrt{17}$<br><br>Area = ½ × 1 × $2\sqrt{17}$<br><br>$= \sqrt{17}$ |
| | Obtains 2 correct values for $x$<br>Condone decimal equivalents AWRT 8.1 and – 0.1<br><br>Or<br><br>Obtains DM or EM = $\sqrt{17}$ | 1.1b | A1 | |
| | Deduces length of DE as the difference between their two values of $x$<br><br>Or<br><br>Deduces the length of DE as twice the length of DM or EM<br>PI | 2.2a | M1 | |
| | Obtains $\sqrt{17}$<br>CAO | 1.1b | A1 | |
| | **Subtotal** | | **4** | |

9.

<table>
<tr><td>11</td><td>Obtains $\frac{dy}{dx}$<br><br>for both the given curves – at least one term must be correct for each curve</td><td>AO3.1a</td><td>M1</td><td>$\frac{dy}{dx} = 6x^2 + 12x - 12$<br>$\frac{dy}{dx} = 60 - 12x$</td></tr>
<tr><td></td><td>States both derivatives correctly</td><td>AO1.1b</td><td>A1</td><td></td></tr>
<tr><td></td><td>Translates problem into an inequality</td><td>AO3.1a</td><td>M1</td><td>Chris's claim is incorrect when<br><br>$6x^2 + 12x - 12 \le 60 - 12x$</td></tr>
<tr><td></td><td>States a correct quadratic inequality<br><br>FT from an incorrect $\frac{dy}{dx}$ provided both M1 marks have been awarded</td><td>AO1.1b</td><td>A1</td><td>$2x^2 + 8x - 24 \le 0$<br>$x^2 + 4x - 12 \le 0$<br>$(x + 6)(x - 2) \le 0$<br><br>Critical values are $x = -6$ and 2<br><table><tr><td>region</td><td>$x < -6$</td><td>$-6 < x < 2$</td><td>$x > 2$</td></tr><tr><td>sign</td><td>+</td><td>–</td><td>+</td></tr></table></td></tr>
<tr><td></td><td>Determines a solution to 'their' inequality</td><td>AO1.1a</td><td>M1</td><td>$-6 \le x \le 2$<br><br>Chris's claim is incorrect for values of $x$ in the range $-6 \le x \le 2$, so he is wrong</td></tr>
<tr><td></td><td>Obtains correct range of values for $x$<br><br>Must be correctly written with both inequality signs correct</td><td>AO1.1b</td><td>A1</td><td></td></tr>
<tr><td></td><td>Interprets final solution in context of the original question, must refer to Chris's claim</td><td>AO3.2a</td><td>R1</td><td></td></tr>
<tr><td></td><td>Total</td><td></td><td>7</td><td></td></tr>
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